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ORIGINAL ARTICLE

The Mediterranean diet for Polish infants: a losing struggle or a battle still worth fighting?

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Abstract The Mediterranean diet is well known for its health-promoting effects. Among its key ingredients, olive oil is the most characteristic. Processing industries have been successfully manufacturing and marketing jarred baby foods with the use of vegetable oils, including olive oil, as well as other sources of visible fat. We aimed to survey manufacturer claims concerning added fat in jarred infant foods supplied to the Polish market. A total of 124 kinds of infant foods from six suppliers were analyzed. Corn, canola, and soybean oil occupied the first three positions, respectively, in rank order of vegetable oils used in jarred baby foods. In our sample, only one type of ready-to-eat jars with vegetables contained olive oil. 11% of products contained cow milk butter or cream. 61% of jarred “dinners” contained poultry or fish, which are typical sources of animal protein in the Mediterranean diet. Given that commercial baby foods currently available in the Polish market contain no olive oil, we advocate considering home preparation of infant foods with the use of visible fat. Medical professionals should encourage food manufacturers to return to the concepts of the Mediterranean diet for young consumers, aimed at long-term health.

Keywords Olive oil · Commercial baby food ·
Homemade food · Dietary patterns ·
Optimal feeding practices

Introduction

During the weaning period and transition to solid foods in the first year of life, infants take a critical step in their eating behavior and need to meet high nutrient requirements [1, 2]. They are exposed to new foods and food combinations, which should ensure a smooth transition to the family diet later in life. At this stage, either homemade or commercially prepared foods may be fed. It is worth noting that in prosperous countries the modern diet differs considerably from that of previous generations, now dominated by products that have been processed, stored, and transported over great distances. Traditional, cold-pressed vegetable oils of the highest nutritional quality, e.g. extra virgin olive oil, may therefore constitute an important part of the modern diet [3, 4].

In Poland, many infants do not receive any traditional homemade foods and even fruits come from purchased jars. Commercial baby foods are regarded by some parents and medical professionals to be more appropriate for several reasons: they undergo intense screening for contaminants in comparison to foods sold for the general population, contain no additives of certain types, and are thought to be designed to help infants meet nutrient requirements [5]. The process of peeling, however, was identified as the most effective, and simple, procedure in reducing residues, e.g. pesticides, in fruits and vegetables [6]. Moreover, contrary to homemade food, which does not contain furan, the highest average content of this chemical was found in ready-to-eat baby foods with pasta meals, followed by vegetable meals and meals with meat [7]. Furan is considered to be potentially hazardous chemical and is classified as a possible carcinogen. The problem of this chemical in homemade food may only arise if meals with potatoes are stored and then hardly re-heated [7].

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There is a growing body of evidence that flavor experiences and dietary patterns in childhood influence these patterns later in life [1, 8, 9]. It is most likely early in life that culture-specific flavor preferences are initiated [10, 11]. Consequently, exposure to flavors and smells of transitory foods may serve to heighten preferences for “known tastes” in the family diet later in adulthood. Moreover, adopting elements of childhood dinner patterns was recognized to be an important part of the social reproduction of family identities across generations [12].

Processing industries have been successful in manufacturing and marketing jarred baby foods on a commercial scale. Available products contain different ingredients and depend on the manufacturer, country, traditional cuisine, income rate, and lastly, personal beliefs and values of parents [9, 11]. Jarred foods with vegetables, meats, and desserts may contain added fat from a variety of sources: vegetable oils, cow milk butter, or cream. Manufacturer advertising makes the majority of consumers feel safe, causing them to believe that they are doing the best possible in buying given products [11]. A noteworthy fact is that many types of baby foods produced by international manufacturers are, in essence, the same mixtures with different names; this procedure aims to exploit the specifics of local markets without delivering any new, real value [11].

In the book, *How to Eat Well and Stay Well the Mediterranean Way* by Keys [13] first used the term “good Mediterranean diet” to describe the eating patterns of populations dwelling in southern Europe, where the olive tree (*Olea europaea*) is an emblematic species [4, 14]. There is variation between the exact diet in different parts of the Mediterranean region. However, generalized and distinctive dietary patterns do exist, including olive oil as the main source of visible fat, employed both in cooking and as a dressing, moderate fish and poultry but low red meat consumption, high intake of vegetables, fruits, legumes, nuts, and whole-grain cereals [4, 14–16]. When dietary fats are added, in accordance with the traditional Mediterranean diet, olive oil is the choice for children [17]. It has been repeatedly observed that individuals applying the Mediterranean diet have reduced risks of type 2 diabetes and other diseases associated with the metabolic syndrome, autoimmune diseases, and certain forms of cancer [18]. Moreover, considerable evidence exists that the Mediterranean diet increases quality of life in the course of ageing, as well as longevity [13, 19]. The health benefits of olive oil have been attributed to two main constituents: a high oleic acid (monounsaturated fatty acid, 18:1n-9) content (70–85%) and a large amount of antioxidant compounds, which also possess antiviral, antibacterial, and immunomodulating effects [3, 4, 14, 16]. Polyphenols found in virgin olive oil are linked to both its flavor and its remarkable stability [3].

The introduction of solid foods in infancy is one of the primary matters often discussed by parents with their child’s pediatrician. However, many parents do not feel that the diet of their child may be linked to poor health outcomes in the future. Parents should be educated about the interplay of environmental and genetic influences on children, specifically during the early years of development when the child is maturing and taking control of its own diet [11]. Nutrition educators should increase the critical awareness of parents in relation to their child’s solid food choices. It is important to emphasize to parents the fundamental role that the Mediterranean diet and consumption of foods with olive oil play in a healthy life style [14, 20]. Parental management of the family food environment may be complicated by numerous mitigating factors, e.g. health literacy, time availability, and financial resources. Considering the role baby food manufacturers play in the infant’s contextual environment, their products, as well as the manufacturers themselves, should also be viewed as key players and central agents in establishing dietary habits. Consequently, we attempted to survey manufacturer claims concerning added fat in jarred infant foods supplied to the Polish market.

Methods

Commercially jarred baby foods containing vegetable or animal fat, as an ingredient specified by producers, were chosen for the investigation. The products, offered for children aged 5–12 months were collected from six brands available on the Polish market in November 2009 (Gerber, Hipp, Nutricia, Hama, Rossmann-Babydream, and CarrefourBaby). A total of 124 jarred foods were classified by type: vegetables, mixed main dishes (so-called “dinners” containing vegetables and meat), and dessert-type foods.

Results

Of the jarred baby foods containing added fat supplied to the Polish market, a large proportion constituted so-called “dinners” (68%) and mixtures of vegetables (19%) whereas desserts were less significant (13%) (Table 1). None of the manufacturers delivered precise data about the amounts of added fat. Only 11 (9%) of the examined foods provided information regarding vegetable oil content, without specification of the source. More than one kind of fat was added to two different products. Only in one type of mixed vegetables did the manufacturer specify that olive oil was used (Table 2). The most frequently used fat, however, was corn oil (Table 2). The dinner-type foods contained either meat (chicken, turkey, pork, beef, veal, lamb, and rabbit) or fish

Table 1 Declared sources of added fat in jars in relation to type of infant's solid food (vegetables, so called "dinners" and dessert-type foods)

Type of food	Number of brands	Olive oil, n (%)	Canola ^a , n (%)	Soybean oil, n (%)	Corn oil, n (%)	Sunflower oil, n (%)	Palm oil, n (%)	Butter, n (%)	Cream, n (%)	Unspecified vegetable oil, n (%)
Vegetables	24 ^b	1 (4.5)	3 (12.5)	2 (8.3)	13 (54.2)	0	0	3 (12.5)	3 (12.5)	2 (8.3)
"Dinners"	84	0	24 (28.6)	12 (14.3)	28 (33.3)	7 (8.3)	0	9 (10.7)	0	4 (4.7)
"Desserts"	16	0	0	0	9 (56.2)	1 (6.2)	1 (6.2)	0	0	5 (31.2)

^a Low-erucic acid rapeseed oil^b There are two brands with more than one source of added fat [(1) canola + butter + cream; (2) corn oil + cream]**Table 2** Declared sources of added fat in jars with infant solid food in relation to manufacturers

Manufacturer	Number of brands	Olive oil, n (%)	Canola ^a , n (%)	Soybean oil, n (%)	Corn oil, n (%)	Sunflower oil, n (%)	Palm oil, n (%)	Butter, n (%)	Cream, n (%)	Unspecified vegetable oil, n (%)
A	37	0	19 (51.4)	0	9 (24.3)	0	0	8 (21.6)	1 (2.7)	0
B	39	0	7 (17.9)	14 (35.9)	11 (28.2)	1 (2.6)	0	3 (7.7)	0	3 (7.7)
C	33 ^b	0	1 (3.0)	0	30 (90.9)	0	0	1 (3.0)	2 (6.1)	2 (6.1)
D	6	0	0	0	0	0	0	0	0	6 (100)
E	8	0	0	0	0	7 (87.5)	1 (12.5)	0	0	0
F	1	1 (100)	0	0	0	0	0	0	0	0
Total	124 ^b	1 (0.8)	27 (21.8)	14 (11.3)	50 (40.3)	8 (6.5)	1 (0.8)	12 (9.7)	3 (2.4)	11 (8.9)

^a Low-erucic acid rapeseed oil^b There are two brands with more than one source of added fat [(1) canola + butter + cream; (2) corn oil + cream]

(lax, cod) with different intramuscular fat contents. 51 of the 84 (61%) types of dinners contained poultry or fish, which are typical ingredients of the Mediterranean diet. Cereal content was also varied among the examined 110 foods and included corn, wheat, rice, hordeum, and oats, which were added to four types of desserts.

Discussion

An increasing number of working mothers strongly influences the demand for ready-to-eat jars. This contrasts with a traditional diet comprising mostly of foods produced and marketed locally, and eaten shortly after harvesting. It is clear that early sensory experiences have an impact on the acceptance of food later in life. Mediterranean ingredients like extra virgin olive oil, fresh garlic and potted basil appear to be the most prominent taste markers in the dinner patterns of the Western middle class [12]. The use of olive oil provides volatile and non-volatile flavors that are reflected throughout the entire dish [3]. Moreover, it should be noted that using olive oil in the kitchen encourages the consumption of large amounts of vegetables and legumes, antioxidant and fiber-rich foods, without trans fatty acids, which many westernized consumers would otherwise find difficult to fit into their diet [14]. Polish infant feeding

guidelines recommend the use of olive oil, low-erucic acid rapeseed oil (canola), and butter in the first year of life [21]. Unfortunately, in our study only one type of ready-to-eat jars contained olive oil. Corn oil, which is not advised in Polish infant guidelines, occupies the first position in rank order of visible fat used in jarred baby foods supplied to our market. Canola oil is ranked second in the list of oils added to ready-to-eat baby foods. Contrary to corn oil, canola is now held by some experts to be the best available edible oil [22]. Canola oil is lowest in saturated fat among vegetable oils and is more than twice as high in α -tocopherol than soybean oil. Soybean oil, which is the dominant edible oil in the US, was used by only one manufacturer present on the Polish market. Sunflower oil is regarded by some experts as unsuitable for manufacturing shelf-stable foods because of its poor oxidative stability [23]; in our sample, it was found to be used by two producers. Palm oil, derived from palmitic acid esterified to sn-1 and sn-3 positions, increases fecal hardness due to lipid absorption and calcium salt formation, and is not advisable for young children [24]. In our study, one type of jarred dessert with fruits and biscuits was found to contain palm oil. Natural, semi-solid palm oil was reported to be beneficial for the aeration of fat-sugar mixtures [25]. 11% food types contained cow milk butter or cream. Baby foods with butter or cream are more popular in Russia and France

[11]. Greco et al. [17] made a noteworthy suggestion that Italian children aged 5–32 months seem to be losing some of the advantages of the Mediterranean diet as a result of the increasing use of processed, full-fat dairy products. However, current recommendations are to avoid the restriction of fat in children under the age of 2–3 years [1, 26]. The role of dietary fat types as early determinants of childhood obesity has, as yet, been poorly studied [26]. As solid foods become a larger part of the daily regime, it is important that products chosen be linked to a beneficial, nutritious diet. It therefore seems reasonable to recommend foods containing olive oil, which help to promote good eating habits for the future.

Current recommendations for solid feeding of infants are based on relatively few facts and many opinions [1]. However, primary prevention of cardiovascular disease, which remains a major health problem in modern, westernized populations, should begin in children, as early vascular lesions already start to develop in the first years of life [20]. Olive oil consumption provides benefits for plasma lipid levels, oxidative stress, and is inversely associated with the reduction of systolic and diastolic blood pressure [4, 14]. These and other factors provide the basis for regarding the consumption of olive oil as the gold standard of a healthy diet for children. Allergies are becoming an increasing problem worldwide. The results of Chatzi et al. [27] and Kim et al. [28] studies suggest that adherence to the Mediterranean diet helps in the prevention of allergies in children. An anthroposophic, holistic lifestyle approach appears to lessen the risk of atopic diseases [29]. Children from families following an anthroposophic way of life consume mostly homemade food, olive oil, and oats. Interestingly, in Poland, as in other Central and North European countries, the oat has been regarded as one of the most healthy local crops for centuries, and is now of great nutritional interest because of its special composition and association with reductions in risk of cardiovascular disease, diabetes, and obesity [30]. An apparent association exists between the early introduction of oats into the child's diet and protection against asthma [31]. It is not yet clear to what extent oats influence the reduction of allergies and risk of cardiovascular diseases; they do, undoubtedly, play a certain role and are therefore a welcomed ingredient in commercial baby foods. It is noteworthy that the addition of oats can increase the satiating efficiency of the product [32]. In our sample, only 4% of the examined foods with grain ingredients contained oats.

Similarly, as in other European countries, a major part of the Polish baby food market is occupied by several multinationals—Gerber, Nutricia, Hipp, Rossmann—leaving very few opportunities for smaller companies [10]. Polish baby food manufacturers and distributors were rapidly privatized in post-Communist Poland as the country has

become more affluent [33]. However, our country currently lacks the presence of pressure groups interested in controlling baby food profit-making firms, which are thought, by the majority of consumers, to restrict their profits in certain areas voluntarily [34]. Baby food manufacturers are spending millions of dollars to develop newer products but, ironically, technological data on baby food is limited [35]. We do not know the reasons why manufacturers do not use olive oil and why products supplied to the Polish markets are largely based on various types of vegetable oils, depending on the company (in some cases corn oil, in others soya or sunflower oil, etc.). The health of our children is one of the most important investments that we can make. Consistency between recognized nutritional standards, national nutrition goals and practice is regarded as an important goal of public health [36–38]. Guerra et al. [20] reported that Portuguese children aged 12–48 months have lower values of monounsaturated and n-3 polyunsaturated fatty acids in comparison to young Germans, and concluded that traditional food habits are disappearing, even in countries lining the Mediterranean basin. The Mediterranean diet is a practical and highly enjoyable dietary pattern [14]. Unfortunately, young people tend not to associate healthy foods found in the traditional Mediterranean cuisine with positive lifestyle images and “junk” foods increasingly crowd out nutritionally rich essentials [36]. We believe that what we are witnessing, at least in the case of Poland, is a public health crisis with regards to commercially supplied solid foods for infants. Our assessment, as stated similarly by other investigators [20], is that health care professionals should be responsible for encouraging manufacturers and distributors of foods to return to the concepts of a Mediterranean diet for young consumers, aimed at maintenance of long-term health.

If technical reasons are to be blamed for the lack of olive oil use by most manufacturers, a valuable alternative could be considering the production of a variant of jarred infant solid foods to which olive oil would be added by the consumers themselves, directly before serving. If, however, the high price of olive oil is the limiting factor for manufacturers in Poland, then companies could possibly look into diversifying their product supply, reflecting the demands of more conscientious consumers. The main olive oil producing countries have the highest annual consumption per capita—Greece >20 kg, Spain and Italy about 13 kg. In Central Europe and the US, consumption is below 1 kg/capita/year [3]. The supply of olive oil is likely to be easily increased along with its growing demand, as there are good perspectives for the future expansion of olive oil production in many non-Mediterranean regions [39].

In some countries, it is a common practice to prepare meals for infants only partially based on processed foods.

Baby foods found in Italy, for instance, included a significant proportion of jarred or lyophilised (powdered) meats alone, whereas mixtures of meat and vegetables were rather uncommon [40]. Interestingly, there are two types of baby foods containing meat alone, available in the Polish market, that is recommended by the manufacturer for infants who completed 6 months. However, nearly 50% of their content is so-called meat separated mechanically (MSM) and for this reason, we do not feel that they should be consumed by very young children. Generally speaking, an Italian mother, raised herself on the tradition of Mediterranean cuisine and family dinners, feels proud if cooking for her infant [11]. In the Mediterranean region, the perspective of buying jarred baby food in a supermarket for many families seems ridiculous [11]. Parents who claim to feed their infants with only freshly cooked food, among the reasons for doing so list ensuring maximum nutritional quality and preserving vitamins, avoiding artificial additives, and the ability to set a basis for a good taste sense [11]. During processing and long-term storage, vitamin and antioxidant levels decrease [41]. Mothers' education is considered to directly influence how she feeds her child. Young infant gastrointestinal tract is usually unable to handle grossly chopped homemade solid foods, so such diet may exert an inhibitory effect on digestion and nutrients absorption. Caregivers should be aware of food preparing guidelines, e.g. the first solids must be carefully blended in order to increase their digestibility [42]. Digestibility profiles of commercial homogenized products are similar to or often better than those of the corresponding homemade foods [42]. However, another concern has been the association of delayed introduction (after the age of 9 months) of partially blended or lumpy foods and decreased consumption of fruits and vegetables in later life [2, 8].

There is also another point to consider regarding commercially prepared baby foods containing fat. Glass jars are commonly closed using a metal lid coated with a seal made of PVC including up to 50% plasticizers (most commonly epoxidized soybean oil), which comes in direct contact with the jarred food [40]. Parents should be educated that if the jars are stored upright it is more likely that migration of epoxidized oil may occur [40].

Humans have evolved an unusually flexible strategy for feeding infants and using special transitional foods. Sellen [38] suggested that this flexibility might have been adaptive in the different environments in which humans evolved, but it creates the potential for mismatches between optimal and actual feeding practices in many populations. We should keep in mind not only the short-term effects but also consider long-term consequences of infant feeding practices. Finally, it is important to emphasize that the best-known diet of European origin,

producing health-promoting effects is the Mediterranean diet; olive oil prevailing as its keystone. Given that currently commercial baby foods on the Polish market contain no olive oil, we endorse considering home preparation of infant foods with added visible fat.

Key messages

- Flavor experiences and dietary patterns in early childhood influence these models later in life.
- In the Mediterranean diet, olive oil is the main source of visible fat. Olive oil provides flavors that are present throughout the entire dish.
- Jarred commercial baby foods supplied to the Polish market contain no olive oil. Food manufacturers should be encouraged to return to the concepts of a Mediterranean diet for young consumers.

Conflict of interest None.

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